THE PLANT DISEASE REPORTER

Issued By

THE PLANT DISEASE SURVEY

Division of Mycology and Disease Survey
BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING
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SUPPLEMENT 188

THE PLANT DISEASE WARNING SERVICE IN 1949

Supplement 188 December 15, 1949

The Plant Disease Reporter is issued as a service to plant pathologists throughout the United States. It contains reports, summaries, observations, and comments submitted voluntarily by qualified observers. These reports often are in the form of suggestions, queries, and opinions, frequently purely tentative, offered for consideration or discussion rather than as matters of established fact. In accepting and publishing this material the Division of Mycology and Disease Survey serves merely as an informational clearing house. It does not assume responsibility for the subject matter.

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Plant Industry Station Beltsville, Maryland

THE PLANT DISEASE WARNING SERVICE IN 1949

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One of the interesting characteristics of plant diseases in general is their great degree of fluctuation from year to year in their occurrence, prevalence, and destructiveness. The diseases that we have under consideration in the Crop Plant Disease Forecasting Project seem to be no exception. These diseases, late blight of potato and tomato (Phytophthora infestans), blue mold of tobacco (Peronospora tabacina), and downy mildew of cucurbits (Pseudoperonospora cubensis), were as widely distributed in 1949 as in the past three years but generally not as destructive. Figures 1 through 4 plot this year's distribution of these diseases and our short text will attempt to tell the highlights of the second year's observations under the Warning Service.

Phytophthora infestans on Potato:

Infection on potatoes with P. infestans, although reported from the numerous places shown in Figure 1, was of little economic importance this year. Sources of infection included cull piles, seed potatoes, the overwintering refuse resulting in infected volunteer plants, diseased seed, infected tubers, and airborne spores which produced scatter infection. Attack usually took place at from early maturity to full maturity, with infection local to general in occurrence and slight to moderate in effect. At the time of first appearance in the field estimated percentages of infection ranged from 5 to 100. At time of continued spread estimated percentage of infection ranged from a trace to 100, with losses ranging from a trace through slight to a high of 25 to 50 percent.

Weather reports from the various States show that, for the most part, rainfall was light, dews present, and temperature near normal to above normal prior to appearance of the disease, although several States reported heavy rainfall before attack, with temperatures ranging from much below to near normal. The warm wet and warm dry conditions prevailing this summer over the eastern to northeastern portion of the United States

(Fig. 5), probably because of the higher temperatures, prevented the production and dissemination of spores of the fungus.

Fungicides used as sprays included Dithane, Parzate, tribasic coppers, Bordeaux, fixed coppers (Basicop, Perenox), and Dithane and Parzate plus zinc sulfate. All fungicides gave good control when applied properly with adequate coverage. Five States, eastern Ontario, and Quebec reported that Bordeaux was used successfully by from 10 to 50 percent of the growers with good to excellent results. Dusts employed on potato were neutral copper, commercial dusts containing Dithane Z-78 and Parzate, Copper A, and zinc carbamate, with good results obtained. One report listed poor results from the use of yellow copper oxide and copper lime. A schedule of Fungicide Results is given in Tables 1 and 2.

Phytophthora infestans on Tomato:

Tomato late blight likewise was unimportant nationally this year, although reported as severe by growers in several areas. Sources of inoculum were southern plants, carry-over on potatoes, infected potatoes in nearby fields, and scattered infections which suggested airborne spores. Plants were attacked when at young transplant stage, one-half maturity size, at maturity, and at late fruit set. Infection for the most part was reported as general or local, with a few reports of scattered infection. Severe damage was reported at Leesburg, Florida in May. In the Virginia mountain area, also, damage was severe at the time of continued spread of the disease, when there were some large fruits on the plants. Infection in Mississippi was general during the three stages (first appearance, continued spread, and reappearance), with severe damage at first cluster open, and severe to moderate damage on green mature fruit.

Estimated percentage of infection in fields ranged from a trace to 20 at time of first appearance, with higher ranges of 50 to 100 reported in areas more heavily affected. At time of continued spread the range was as wide, i. e., from a trace to 100 percent, the most notable circumstance being the low infection in sprayed fields, which sometimes amounted to only 5 to 10 percent as against 90 to 100 percent in unsprayed fields. Similarly, reduction in yield followed the same pattern, with slight reductions in sprayed fields and as high as 50 percent in unsprayed fields. One State reported up to 100 percent reduction in yield, but no evidence was given as to whether the fields had been sprayed. In Mississippi, although area planted to tomatoes this year was estimated to be 1500 acres more than in 1948, the yield was less by 200 carloads. Part of this reduction was due to stem-end cracking of the fruit brought about by excess rainfall prior to picking, part to buckeye rot (Phytophthora parasitica Dast.), while late blight fruit rot was said to be responsible for 30 percent of the total reduction.

Fig. 1 · DISTRIBUTION of TOMATO LATE BLIGHT in 1949

Fig. 2 · DISTRIBUTION of POTATO LATE BLIGHT in 1949

Fig. 3 DISTRIBUTION of TOBACCO BLUE MOLD in 1949

Fig. 4 DISTRIBUTION of CUCURBIT DOWNY MILDEW in 1949

Rainfall, as affecting tomato late blight this year, was reported rather consistently as being light to moderate, although heavy rainfall was reported in Virginia, Arkansas, Mississippi, Illinois, Pennsylvania, Michigan, and Ontario, Canada, at the time of appearance and spread. In Maryland rainfall was heavy at the time of appearance. Temperatures reported were near normal to above normal. Dews were reported present in the greater majority of cases.

Reports indicated that the increased use of fungicides for control of late blight on tomato, together with the dry summer, probably contributed to the low incidence of the disease. The materials used and their effectiveness in controlling tomato late blight will be found in Tables 1 and 2.

Peronospora tabacina on Tobacco:

The distribution of tobacco blue mold in 1949 is shown in Figure 3. The types of tobacco affected were flue-cured, burley, cigar-wrapper, Havana seed, broadleaf, and shade types. Sources of inoculum were either unknown or reported as old bed-sites. Infection was reported as scattered to local, with general infection noted over the eastern half of North Carolina. Damage was slight except for the Carolinas and Virginia, which experienced a severe blue mold year.

Rainfall was reported for the most part as moderate, above normal in a few cases, with temperatures near normal to above in all reported cases. Estimated percentage of infection ranged from 1 to 100. Reduction in plants in beds was slight, with an estimated high of 10 percent. However, in several cases 100 percent reduction was reported in plant-bed yields, particularly in unsprayed beds.

Where control measures were employed soon enough excellent results were obtained. In South Carolina stunting of plants was induced when the grower used Fermate dusts with Kaolin diluent. No stunting was experienced with Fermate-Pyrophyllite mixtures and no injury was noted to plants.

Psuedoperonospora cubensis on Cucurbits:

Downy mildew of cucurbits is shown in Figure 4 as being, for the most part, present over the eastern coastline States. Acreages involved averaged about 1000 for Pennsylvania and Louisiana, and ranged from 1000 to 5000 in Delaware and Maryland. Sources of inoculum were either unknown, or reported as older plants, spring crop and garden plants, and for northern regions spread from plantings of cucurbits in more southerly regions. In Florida the organism is endemic and wild cucurbits might possibly constitute an additional source of inoculum. Infection occurred from first fruit-set to maturity, with marked activity at time of harvest; it was reported as local in Connecticut, local to general in New York,

and general in Pennsylvania, Florida, Virginia, Louisiana, South Carolina, Maryland, and Delaware. Damage at start was slight. During the time of continued spread it was generally described as moderate, but severe damage was reported in Connecticut, Virginia, Louisiana, South Carolina, Arkansas, and Maryland. Estimated percentage of infection ranged from a trace to 1 at time of first appearance, to 100 at time of continued spread and at harvest. Reduction in yield was reported as trace or none to 75 percent.

Weather conditions accompanying infection were consistently reported as light rainfall prior to appearance of the disease, with moderate rainfall during period of greatest attack and spread. Dews were universally reported. Heavy rainfall occurred at time of greatest attack in South Carolina and Louisiana, and in Ontario, Canada. Temperature in most cases reported was near normal to above normal, with below normal reported from South Carolina, Arkansas, and Ontario.

The most notable event connected with occurrence of downy mildew of cucurbits this year was the loss of the cantaloup crop in South Carolina. Acreage is extensive in this State, while dusting and spraying for control have not been accepted by the vast majority. All of the loss in reduced financial returns and reduced yield in this crop this year can be attributed to downy mildew, which was reported in the worst epidemic form in this State since 1938. Downy mildew was severe on cucumbers also in South Carolina, killing almost 100 percent of the vines in ten days to two weeks after its first appearance.

Phytophthora phaseoli on Lima Beans:

A few reports were received on the incidence of downy mildew of lima bean (Phytophthora phaseoli Thaxt.) Areas of infection included southern New Jersey, south-central and southeast Pennsylvania, Long Island, New York, and Sussex and Kent Counties in Delaware. Source of inoculum is unknown. Infection was local in Pennsylvania and New York, and local to general in Delaware and New Jersey. Estimated percentage of infection in fields ranged from 5 through 55, with as high as 80 percent infection noted on pods on individual plants in localized areas of some fields. Weather conditions at time of infection and spread were indicated as moderate rainfall with temperatures above normal. Serious losses were reported in New Jersey; reduction in yield in other areas was estimated at none to 40 percent. Copper sprays, either Bordeaux or fixed coppers, and copper dust were used. No control results were given.

Conclusions:

Although it is impossible to measure accurately the disease potential from year to year, it would appear from the reports this year that the coordinated efforts on the part of warning service participants are paying good dividends in disease control. Indications are that control

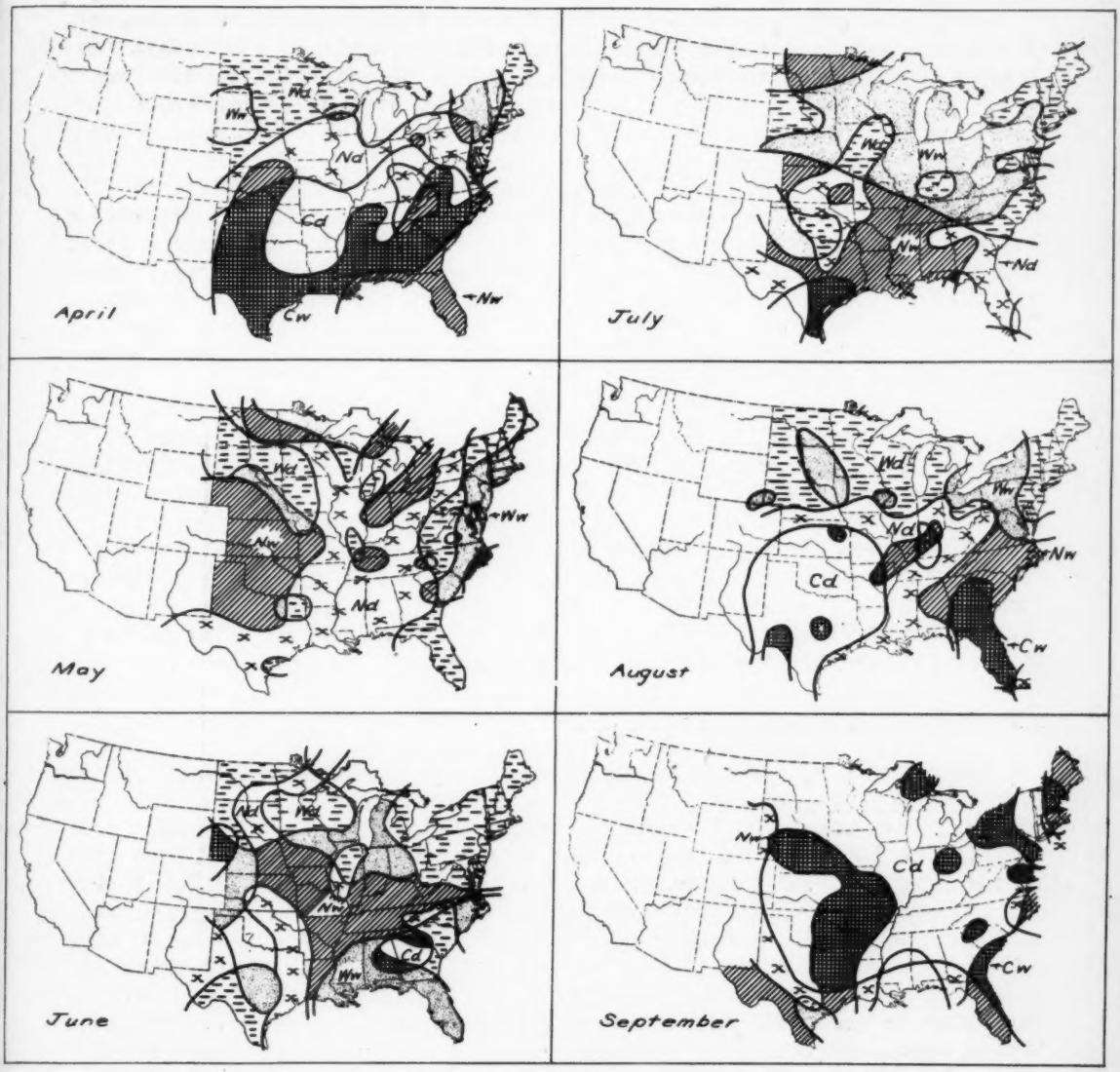

Fig. 5 MONTHLY WEATHER CONDITIONS · April through September 1949

Unshaded	Temperature and precipitation below normal	Cd
	Temperature and precipitation above normal	Ww
	Temperature above, precipitation below normal	Wd
	Temperature normal, precipitation above normal	Nw
	Temperature below, precipitation above normal	Cw
X	Temperature normal, precipitation below normal	Nd

measures were more effectively practiced this year, particularly for tomato late blight and cucurbit downy mildew. The use of blue mold control measures still appears to be governed by the gambling chance that the attack will be light, will come at a time inopportune for fungus growth, or will not appear at all. Tables 1 and 2 summarize all control information received this year.

WORK PERFORMED COOPERATIVELY BY THE CROP PLANT DISEASE FORECASTING PROJECT AND THE PLANT DISEASE SURVEY UNDER THE PROVISIONS OF THE RESEARCH AND MARKETING ACT OF 1946

Table 1. Materials used as sprays and their effectiveness in 1949.

Fungicide or Material	State area or Province[a]				Formula or Dosage	Percent using	Percent Applied by		Results and Remarks
	N.E.	S.	M.W.	Province			Ground Machine	Air-plane	
CONTROL OF LATE BLIGHT ON POTATO									
Bordeaux	5	1	1	2	8-8-100 (2)[b]	48,10	All (2)		Excellent
					10-5-100	25	"		Good
					8-16-16	10	100		Excellent
					4-2-40	25-30	100		Good
					4-4-40	50	100		Excellent
					100-125 gal./ acre - 10 day intervals		All		?
					4-4-50	5	All		Excellent
					8-4-100 Fixed copper- 4 lbs. of 50%	50	100		Good
Fixed Coppers		1	1	2	COC-S		All		Poor
						Approx. 2	All		Good
					1%	10			Good
									One State-no result listed
Basicop				1	COC-S	Approx. 2	All		Good
Perenox				1	" "	Approx. 5	All		Good
Neutral Coppers	2		1		2 lbs./100 gal.(1)	15	All		Excellent
					4 lbs./100 gal.(1)		"		Good
						20	"		Good

For explanation of a and b and abbreviations, see footnote at end of Table II, page 314.

Table 1. Spray materials (continued)

Fungicide or Material	State area or Province[a]				Formula or Dosage	Percent using	Percent Applied by		Results and Remarks
	N.E.	S.	M.W.	Province			Ground	Air-plane	
POTATO (continued)									
Copper Zinc Chromate			1				All		?
Dithane Liq.	1		2	1	2 qts./100 gal. (1)		100		Good
					2-3 qt./100 gal. (1)	45	All		Good
					100-125 gal./acre-10 day intervals		All		?
Dithane Dry	1				1 1/2 /100	4	All		Good
Dithane D-14+ Zn SO_4	1	2			2 qt.- 1 lb./100 gal. (1)	95	100		Excellent
					2 qt./100 gal. (1)	20	100		Good
Dithane						2			Good
Biscarbamates Dithane + Parzate	1				2 qts. + 1 lb. Zinc Sulphate	23	100		Fairly good
Biscarbamates early + copper late in season	1					25	100		Good
Parzate Liq.	1				2-3 qts./100	45	All		Good
Parzate Dry	1		2		1 1/2 lbs./100 gals. (2)	4(1)	100		Good
							100		Good
					100-125 gals./acre-10 day intervals		All		?

Table 1. Spray materials (continued)

Fungicide or Material	State area or Province[a]				Formula or Dosage	Percent using	Percent Applied by		Results and Remarks
	N.E.	S.	M.W.	Prov-ince			Ground Machine	Air-plane	
POTATO (continued)									
Parzate + $ZnSO_4$		1			2 qt. 3/4 lb./100	5	100		Excellent
Parzate (some results given under Biscarbamates: See above)									
CONTROL OF LATE BLIGHT ON TOMATO:									
Bordeaux (included in other sprays: See under Fixed Copper, Zerlate.)	1								
Bordeaux	1		1		4-4-100/8-8-100	15	All		Good
					8-8-100				Used after infection started. Control good except where fruit was badly cracked.
	1	1	1		8-6-100	10	100		Good
					5-5-50	50	100		Good
					3-4-50	5			Excellent
Compound A	1	1			2/100 gal.	3	100		Good
					4/100 gal.	?	All		Clear-cut results obscured because of dry spell three-fourths of May
Fixed Coppers (included in other sprays; see under Zerlate)	1								

Table 1. Spray materials (continued)

Fungicide or Material	State area or Province[a]				Formula or Dosage	Percent using	Percent Applied by		Results and Remarks
	N.E.	S.	M.W.	Province			Ground Machine	Air-plane	
TOMATO (continued)									
Fixed Copper	3	1			tank mix - 2 lbs. of 50% Fixed Copper + 1 lb. Zerlate in all or most sprays	3	100		Good
					4 lbs. 50% Cu./ acre or Bordo 3-6-100	9	100		Good
					2 lb. actual/100 gal.	75	99.5		Excellent
					1% Cu	10			Good
Copper		1			2/100 gal.	10	100		When spray started on time and repeated once each week and after each rain very good results obtained
Neutral Coppers	1					20	All		Good
Tribasic Copper Sulphate	1	1			2 lbs./100 gal.	15	100		Excellent
					4 lbs./100 gal.	?			Clear-cut results obscured because of dry spell in May
Dithane or Parzate	1					1	1		Fairly good
Dithane Z-78	1				2-100	Trace	All		Excellent
Dithane D-14 + $Zn\ SO_4$	1	1			2 qt. + 1 lb./ 100	95	100		Fairly good to excellent depending on application

Table 1. Spray materials (continued)

Fungicide or Material	State area or Province[a] N.E.	S.	M.W.	Prov-ince	Formula or Dosage	Percent using	Percent Applied by Ground Machine	Percent Applied by Air-plane	Results and Remarks
TOMATO (continued)									
						Trace	All		Excellent
Parzate (see under Dithane)									
Parzate		2			2 lbs./100	All			When sprays started on time and repeated once each week and after each rain, very good results obtained
						?			Clear-cut results obscured because of dry spell during three-fourths of May
Parzate Z-78	1				1 1/2 /100	5	All		Good
Parzate Liq. + $ZnSO_4$		1			2 qt./3/4 lb.	5	100		Fair to excellent depending on application
Zerlate (included in other sprays: See under Fixed Copper)									
Zerlate spray	1				1-2-3 (2 lbs.) + Bordeaux 3-6-100 or Fixed Copper 4 lbs. in sprays 4-5-6	83	100		Good
Zerlate followed by copper	1					5	All		Good

Table 1. Spray materials (continued)

Fungicide or Material	State area or Province[a]				Formula or Dosage	Percent using	Percent Applied by		Results and Remarks
	N.E.	S.	M.W.	Province			Ground Machine	Airplane	
TOMATO (continued)									
Zerlate alternating with copper			1			50	All		Control good where last two sprays were copper, poor where last spray was Zerlate
Zinc dimethyl Dithiocarbamate	1				2/100	75	99.5		Excellent
CONTROL OF CUCURBIT DOWNY MILDEW									
Bordeaux	1	1			cuc. ?-4-100 (1) melons 4-2-100	35	95		(No results given)
					4-4-50 (1)	50	100		Good. In certain fields anthracnose caused very severe damage where materials gave poor control
Fixed Copper	2				4 lbs. 50%	40	95		(No results given)

Table 1. Spray materials (continued)

Fungicide or Material	State area or Province.[a] N.E.	S.	M.W.	Province	Formula or Dosage	Percent using	Percent Applied by Ground Machine	Percent Applied by Air-plane	Results and Remarks
CUCURBITS (continued)									
					4-100				Good. When used in time, held the disease in check
Tribasic	1				3-100 (melons)	10	100		Excellent
Dithane D-14 + $ZnSO_4$		1			2 qts., 1/2 lb.	All	All		Generally good
Dithane Z-78	2				2-100 (2)				Good. When used in time, held the disease in check
					no formula - (melons)	5-7	100		Excellent
Zerlate	1				2-100 (melons)	5-7	100		Excellent
CONTROL OF BLUE MOLD OF TOBACCO									
Copper or Bordeaux	1				4 lbs. fixed Cu.	24	100		Fairly good
Fermate	3	2			3 lbs./100 (2)	50	100		About 25% received excellent results, 50% good and

Table 1. Spray materials (continued)

Fungicide or Material	State area or Province.[a] N.E.	S.	M.W.	Prov-ince	Formula or Dosage	Percent using	Percent Applied by Ground Machine	Percent Applied by Air-plane	Results and Remarks
TOBACCO (continued)									
									25% none or no control. Results depended on how good a job done
						66	100		Good
					1-2 lbs./100	95	95		Excellent
					4-100	50	All		Excellent to good
					no formula	10		none	Good
Fermate - Karbam	1				2-100-4-100	70	All		Mostly good
Ferbam		1			2-3 lb./100 gal.	15			Good
Dithane		1				50		none	Good
Parzate Z-78	1					Trace			(No results given)
P. D. B.						100		none	Good

Table 2. Materials used as dusts and their effectiveness in 1949.

Fungicide or Material	State area or Province[a]				Formula or Dosage	Percent using	Percent Applied by		Results and Remarks
	N.E.	S.	M.W.	Province			Ground Machine	Air-plane	
CONTROL OF LATE BLIGHT ON POTATO:									
Basicop				1	?		100		Good
Copper A.				1	"	2	100		Good
COC-S				1	"				
COC-S			1	1		1	100		Fairly good
					6% Met. Cu.	90	10		Good
Copper-lime dust		1			20% Cu-80% lime	5	100		Fair
Fixed Copper	2	1			7%	48	All		Good to poor
					7%	2	70	30	Fair
					6%	10		none	Good
Misc. Copper dusts		1				2	100		Good
Neutral Copper	2					90	100		Good
					7%	5	All		Good
Tribasic Copper Sulphate	1	1	1		7% Met.-Cu. in all cases	90	10		Good
						75	90	10	Good
						20	100		Good
Yellow Copper oxide		1			6% Met.-Cu.	5	100		Poor
Dithane Z-78		2			3.9% active ingredient (1)	10	100		Poor to good

Table 2. Dust materials (continued)

Fungicide or Material	State area or Province				Formula or Dosage	Percent using	Percent Applied by		Results and Remarks
	N.E.	S.	M.W.	Province			Ground Machine	Air-plane	
POTATO (continued)									
					Mfg. (1)	5			Good
Dithane			1		6%	90	10		Good
Parzate Z-78	1				10%	1	All		Good
Parzate			1		6-8%	90	10		Good-excellent
CONTROL OF LATE BLIGHT ON TOMATO									
Copper	2				7%	4	2	2	Fairly good
					6%	40	All		Good
Copper A		1			12%	?			Clear-cut results obscured because of dry spell three-fourths of May
Fixed Copper	1	1	1		20-80	25		100	Good
					5-7	5	All		Good
					6% Cu.	5	All		Poor
Copper Lime	1				20% Cu-80% Lime	5	100		Poor
Tribasic Copper Sulphate	1				7% Met. Cu.	20	100		Good

Table 2. Dust materials (continued)

Fungicide or Material	State area or Province.[a] N.E.	S.	M.W.	Province	Formula or Dosage	Percent using	Percent Applied by Ground	Percent Applied by Air-Machine	Percent Applied by Airplane	Results and Remarks
TOMATO (continued)										
Yellow Copper Oxide	1				4.8%	10	100			Poor
Dithane Z-78 (commercial dust containing Dithane)		1			6%	?				Clear-cut results obscured by dry spell during three-fourths of May
Parzate Z-78	1				10%	50	All			Good
Zinc Carbamate	1				10%	5	All			Good
CONTROL OF CUCURBIT DOWNY MILDEW										
Fixed Copper	1				7%	5	5			(No results given)
Copper dusts		2			7% Met. Cu. 5%	35 5	100		none	Good Fair results if used properly. Very little increase in yield
Tribasic	1				5% Cu.	60	10	90		Good

Table 2. Dust materials (continued)

Fungicide or Material	State area or Province[a] N.E.	S.	M.I.	Prov-ince	Formula or Dosage	Percent using	Percent Applied by Ground Machine	Air-plane	Results and Remarks
CUCURBITS (continued)									
Organic dusts (Fermate and Dithane Z-78)		1			6-10%	15	100		Good. In certain fields anthracnose caused very severe damage where these materials gave poor control
Dithane Z-78	1	1			4-6% (watermelons)	35-40 of Acreage		over 50	Good
					4% (cantaloupes) one State	Less than 2	Total		Poor
					6%	10	10	90	Good
Zerlate	1				10%	10	20	80	Good
CONTROL OF TCB.CCC BLUE MOLD									
Dithane Z-78		1			± 6 1/2% active	Experimental			Excellent
Fermate	3	4			15% (4)	very little			
						10	All		Good
						75	Hand dusters		Poor-excellent
						10-15			Good
						few			Good
						15	100		Results almost the same as for

Table 2. Dust materials (continued)

Fungicide or Material	State area or Province[a]				Formula or Dosage	Percent using	Percent Applied by		Results and Remarks
	N.E.	S.	M.W.	Province			Ground Machine	Airplane	
TOBACCO (continued)									
									Fermate spray (see above) except, perhaps, a little less effective
						10	none		Good
Ferbam		1			15%	1			Good
Parzate		1			± 6 1/2% active	Experimental			Excellent

[a] Explanation of abbreviations:

N.E. = Northeastern States: Maine, Vermont, New Hampshire, Massachusetts, Connecticut, Rhode Island, New York, New Jersey, Pennsylvania, Delaware, Maryland, West Virginia, and Ohio.

S. = Southern States: Virginia, Kentucky, North Carolina, South Carolina, Tennessee, Arkansas, Oklahoma, Texas, Louisiana, Mississippi, Alabama, Georgia, and Florida.

M.W. = Mid-western States: Michigan, Indiana, Illinois, Wisconsin, Minnesota, Iowa, Missouri, Kansas, Nebraska, South Dakota, and North Dakota.

Province = Canadian Provinces: Prince Edward Island, Nova Scotia, New Brunswick, Quebec, and Ontario.

[b] ( ) Numbers in parentheses refer to number of States or Provinces using same formula; and, likewise, number of States or Provinces with same percentage of growers using where ( ) appears in "percent using" column.